

single tubercle. Fingers not webbed; toes broadly webbed. Disks well developed. The length of the body equals the distance of the vent from the heel. Upper parts of a greenish white, with small black or brownish specks irregularly disposed; hinder part of the thigh not coloured; lower parts white.

Two specimens, presented by W. Ferguson, Esq., F.L.S.; the larger is 26 millims. long, the hind limb being 40 millims.

Ixalus hypomelas.

Snout not flattened, of moderate length, somewhat rounded in front, with distinct canthus rostralis, and with the loreal region subvertical. Eye of moderate size; tympanum hidden. Skin smooth. Metatarsus without fringe or fold, and with a single tubercle. Fingers not webbed; web of the hind foot rudimentary. Disks rather small. The length of the body is scarcely equal to the distance of the vent from the heel. Coloration varies: the most characteristic form is chocolate-brown above, with the sides and lower parts black, spotted with white; a fine white line runs along the middle of the back and of the abdomen, beginning from the snout, the abdominal line being frequently crossed by another white line, running from one fore leg to the other; metatarsus with a white line along its outer margin. All or some of these lines may be absent. Sometimes the upper parts are dark purplish (the snout being of a lighter colour) or purplish grey mottled with brown. In one variety, in which all the white lines are absent, the upper part of the snout as well as of the forearm is of a uniform greyish-white colour.

The largest of several specimens is 22 millims. long, the hind limb being 35 millims. We have received specimens of this species in Col. Beddome's and Mr. Ferguson's collections.

XL.—*Remarks on Mr. Carter's Paper "On the Polytre mata, especially with reference to their Mythical Hybrid Nature."*
By WILLIAM B. CARPENTER, M.D., F.R.S.

HAVING been prevented by absence on the Continent from perusing Mr. Carter's paper at the time of its publication, I take the earliest opportunity in my power of expressing the great interest with which I have read it, and my entire concurrence in that part of it which relates to the "mythical hybrid nature of *Carpenteria*." It was scarcely to be expected that when I first drew attention to the singularly aberrant

types of Foraminiferal structure which are presented in *Polytrema** and *Carpenteria*†, I should be able to give an exhaustive account of their structure and affinities. My specimens were then few in number, and were derived from a limited set of sources. And while I had not at that time recognized the presence of sponge-spicules either in the canals, chambers, or solid skeleton of *Polytrema*, I had found the chambers of every specimen of *Carpenteria* which I had then examined to be so universally pervaded by them, that I was disposed to agree with Dr. J. E. Gray in the idea that they properly belonged to the organism, which might thus be regarded as a connecting link between Foraminifera and Sponges,—this probability appearing to be strengthened by the curious resemblance in form which the conical *Carpenteria*, with its apical orifice, bears to the papilla of a Sponge with its terminal oscule. This suggestion, however, I put forth (as Mr. Carter truly says) with a certain reserve; and I held myself quite open to modify or withdraw it, as further evidence might indicate‡. Prof. Max Schlutze's paper of 1863 showed me that there was a closer affinity between *Polytrema* and *Carpenteria* than I had originally supposed. And the subsequent examination of a considerable number of specimens of both types which have come into my hands from various sources, has satisfied me on the following points:—

1. That the polymorphism of *Polytrema* is much greater than I was originally aware of, and that what Mr. Carter terms the "cavernous dilatations" of the interior, which I had only recognized as canals traversing the solid fabric, are often

* 'Introduction to the Study of the Foraminifera,' 1862, p. 235.

† Philosophical Transactions, 1860, p. 564; and 'Introduction,' p. 186.

‡ This is explicitly stated in my original description of *Carpenteria* (Phil. Trans. 1860). After referring to the opinion of Mr. Cuming and other experienced conchologists that the organisms in question belong to the sessile Cirripeds, I thus continue:—"Their true nature was first suspected by Dr. J. E. Gray, who was led by his study of them to consider them as the testaceous envelopes of a Rhizopod intermediate between *Sponges* and *Foraminifera*; the grounds on which he came to this conclusion being, that he found the shell to be multilocular and minutely foraminated like that of certain Foraminifera, whilst the fleshy substance occupying its chambers is strengthened with spicules like those of Sponges. Hence he considered this organism in the light of a Sponge enveloped in a shelly case with a single terminal oscule. My opinion as to its character having been asked by Dr. Gray, I soon found reason to agree with him in his general idea of its affinities; the structure of the shell being most characteristically *foraminiferous*, whilst the substance occupying its chambers is no less characteristically *spongeous*. In communicating this result, however, to Dr. Gray, I thought it right to suggest the possibility that this spongy substance might be parasitic; the tendency of certain Sponges to find their way into very minute fissures and passages

found, especially in the spreading forms designated by Mr. Carter as *P. utricularæ*, to be capacious chambers bearing a strong general resemblance to those of *Carpenteria*.

2. That the canals and chambers of *Polytrema* often contain Sponge-spicules, which are also not unfrequently incorporated with their walls; so that, as there can be no reasonable doubt of the *accidental* nature of the inclusion of these spicules in the interior of *Polytrema*, the probability is strong that their presence in *Carpenteria* is to be accounted for similarly.

This probability was further confirmed to me (3) by the examination of specimens of the typical *Carpenteria* that proved to be entirely destitute of these spongy contents, which, on the hypothesis of their "hybrid" nature, they ought always to exhibit.

I entirely and unreservedly surrender, therefore, the idea that *Carpenteria* has any affinity to Sponges, and fully admit, with Schultze and Carter, its affinity to *Polytrema*. But I still demur to that extinction of *Carpenteria* as a generic type which Mr. Carter proposes; and I trust that, in specifying my reasons for its retention, I shall not be thought to be influenced by any undue preference for the name which Dr. Gray complimented me by assigning to it.

If we abandon, in the taxonomy of FORAMINIFERA, every generic type which can be shown to have a close or even a continuously gradational affinity to some other, we shall be thrown back into hopeless confusion. It is absolutely necessary, for the natural grouping of their multiform varieties, to have *some* basis of arrangement; and this seems best obtained by adopting as genera those strongly diversified types which are capable of most definite characterization by fundamental differences in plan of growth, and by regarding these as centres round which the less-differentiated forms may be

having been observed by me in my researches on the structure of the shells of Mollusks. Dr. Gray, however, agreed with me in thinking this improbable, for reasons which will be presently stated" (p. 565). Among these reasons, it is now somewhat amusing to find the statement of Mr. Denis Macdonald, that, in the voyage of H.M.S. 'Herald' in the Australian Seas, "he met with various forms of branching Sponges, possessing a peculiarly solid calcareous skeleton, and in many instances appearing to present the same kind of transition from *Sponges* towards *Foraminifera*, that, if my view be correct, is afforded by *Carpenteria* from *Foraminifera* towards *Sponges*." These specimens having been kindly placed in my hands by Dr. Macdonald at a subsequent time, when I was investigating the structure of *Polytrema*, I at once recognized them as very characteristic representatives of that type, incrusting with a parasitic Sponge, which I placed in Mr. Carter's hands for description; so that this supposed link between *Sponges* and *Foraminifera* gave way as soon as it was properly tested.

grouped in accordance with the direction of their modification. Thus, taking the *Milioline* series as an illustration, we accept *Spiroloculina*, *Biloculina*, *Triloculina*, and *Quinqueloculina*, not (in the sense of D'Orbigny) as generic names of groups capable of being sharply differentiated from each other, but as designations of certain well-marked types that may be conveniently adopted as points of departure for the orderly arrangement of those multitudinous specific and varietal modifications which, when thus studied, are found to constitute a continuous nexus that defies all attempts at classification by strict definition. So, I should suppose, no one would think of abolishing generic types so strikingly differentiated as *Cornuspira* and *Orbitolites* because both of them in their earliest stage of growth often correspond with the *Milioline Spiroloculina*. Nor should we be wise in abandoning the generic distinction between *Orbitolites* and *Orbiculina* because, in the later stages of their growth, marginal fragments of the disks of these two types cannot be distinguished from each other. Nor, again, does the discovery by M. Munier-Chalmas of a type most curiously intermediate between *Peneroplis* and the spiral *Orbiculina* (the continuous chambers of the former being partly subdivided by transverse indentations of their walls, so as to take the form of moniliform rows of freely communicating chamberlets) invalidate the propriety of retaining those two well-characterized types as generic centres. The same is preeminently true of the *Cristellarian* and *Rotalian* groups, and still more, if possible, of those Arenaceous forms, often bearing a most curious isomorphic resemblance to the calcareous-shelled Foraminifera, which are among the most remarkable novelties brought to light by recent Deep-Sea explorations. In fact, if we say that in each of the principal series of FORAMINIFERA "every thing graduates into every thing else," we shall not be far from the truth.

If, then, we agree to retain as generic centres the forms most strongly differentiated in their plans of growth, I maintain that the typical *Carpenteria* is generically distinct from the typical *Polytrema*. The latter, as Mr. Carter truly says, is essentially a *branching* structure; and the base from which it rises, in all the instances in which I have examined it, has (like the primordial plane of *Tinoporos*) more or less of the "Planorbuline" arrangement, the Rotaline spiral very early giving place to the cyclical mode of increase. The upward growth of this branching structure essentially consists in a vertical piling-up of minute chambers resembling those of the basal disk; and the distinctive peculiarity of the typical *Poly-*

trema seems to consist in the grouping of these chambers round large canals, which traverse the stem and branches, and open at the extremities of the latter. Sometimes, however, *Polytrema* spreads itself out peripherally, without any branching, so as to form subconical expansions, only distinguishable externally from the outspread sessile forms of *Tinoporus* by the opening of canals at or near their apices; and in other instances it forms compact globose masses, only distinguishable externally by their sessile habit, and by the presence of canal-openings, from the ordinary globose forms of *Tinoporus*. The closest resemblance to *Carpenteria* is presented by that modification of *Polytrema* which is designated by Mr. Carter as *P. utricularis*; for in this we find large spreading cavities taking the place of the canals, and opening externally by prominent vents which bear a strong resemblance to those of *Carpenteria*. But, like the canals of the branching *P. miniacum*, these cavities do not (as it seems to me) form any part of the chamber-system, but are simply *interspaces* left in the midst of what would otherwise be (as in *Tinoporus*) a continuous pile of minute chambers resembling those of the original planorbiline base.

On the other hand, as I stated in my memoir of 1860, the arrangement of the primary chambers of the typical *Carpenteria* is distinctly spiral—the chambers all opening into the depressed umbilicus, as in *Globigerina**. This plan is clearly traceable through the entire growth of the organism,—the successive whorls spreading out by the rapid enlargement of the chambers, and each whorl enclosing its predecessor; so that, the base being progressively extended with the augmenting height, a cone is built up, having a prominent apex in place of the original depressed umbilicus. At the summit of this cone there is always an apical orifice (sometimes prolonged

*“I have fortunately been enabled to determine this point by the comparison of several specimens in different stages of evolution, and by the removal from older specimens of one whorl after another until the original nucleus was arrived at (an operation which has been very dexterously performed for me by my draughtsman, Mr. George West); and I can state without any hesitation that the early condition of this apparently anomalous organism accords with that of the *Helicostegæ* Foraminifera generally,—its approximation being the closest to *Rotalia* in its general form, but its tendency being rather towards *Globigerina* in this particular, that its chambers do not seem to communicate directly with each other, but that each has a separate external orifice directed towards the umbilicus.” (Phil. Trans. 1860, p. 567.) Unless Mr. Carter, by the dissection of a typical specimen of *Carpenteria* (such as one of those on Mr. Cuming’s *Porites*) can show that the above description is erroneous, I must take leave to maintain its title to stand, against his account of a supposed embryo of his *Polytrema balaniforme*.

into a tube) communicating with each principal chamber of the successive whorls; and thus the specially Globigerine type is maintained throughout. As the successive chambers enlarge, a tendency shows itself to subdivision into chamberlets by a thickening or infolding of their outer wall; but although this partial subdivision gives to the external surface an areolation closely resembling that of *Polytrema*, the resemblance is for the most part apparent only, the subdivision seldom going so far as to cut off these chamberlets from the general cavity of the chamber. The two types thus differ essentially, not merely in plan of growth, but in the relation of their small to their large cavities; for while the branching canals or utricular dilatations of *Polytrema* are mere *cavitary interspaces* in the midst of a fabric built up by the aggregation of minute chambers, the cavities of *Carpenteria* are its *true chambers* arranged in regular spiral succession, and are separated from each other by complete septa, whilst partially subdivided into chamberlets by imperfect septa. Hence, however strong the general resemblance between Mr. Carter's *Polytrema utriculare* and his *P. balaniforme* (= *Carpenteria*), I hold that their morphological difference is quite sufficient to justify the retention of *Carpenteria* as a distinct generic type—its alliance being rather with *Globigerina* than with *Polytrema*, and the latter, like *Tinoporus*, being an extraordinary development of the Planorbuline type.

If Mr. Carter can show that fundamental differences of similar importance exist between *Patellina* and *Conulites*, I shall willingly accept his plea for the retention of the latter genus, which I only merged in *Patellina* because it seemed to me (as to my coadjutors, T. Rupert Jones and W. K. Parker) to agree with that type in plan of growth, and to differ from it only in degree of development.

Both these opinions I hold (as I hope that I do all others) with a readiness to modify or surrender them as further extension of our knowledge in regard to the subjects of them may require. And in this connexion it gives me great pleasure to be permitted by my friend Mr. Carter to cite the following passage relative to my 'Introduction' from a letter he has been good enough to write to me on the questions under discussion:—

"Of course you feel interested in what you yourself have indicated in your 'Introduction' on *Polytrema* and *Carpenteria*; but the *title* itself of your work means no more; and as in natural science all is progressive, and as much due (and even often more) to those who have introduced a subject, as to those who have made the introduction a stepping-stone to

rectification or further discovery, what is written under such circumstances should always be considered *provisional*, and accepted with thankfulness, inasmuch as, according to the old proverb, we should not 'blame the bridge that carries us over.'

To the foregoing general survey of the relations of *Polytrema* and *Carpenteria*, I would now append two notes on points of detail.

1. I stated in my 'Introduction' (p. 236) that while "the whole shelly texture of *Polytrema* has ordinarily a less solid character than that of *Tinoporus*, although formed on a plan essentially the same," "we occasionally find an aggregation of calcareous substance in solid pillars exactly resembling those which we have seen in *T. baculatus* and in *Patellina Cooki*." This last statement, although borne out by a figure, is designated by Mr. Carter (p. 191) as "imaginary;" and taken in connexion with what follows, it certainly appears to me (and I think it would so appear to readers in general) as if Mr. Carter intended to impute to me that I had mistaken the small *hollow* pillars that pass between the earlier-formed stories of the fabric (which hollow pillars he likens, I think correctly, to those of *Parkeria*), for *solid* pillars resembling those of *Orbitoides*. Having forwarded to Mr. Carter the specimen on which my description and figure were based, I am authorized by him to state that he never intended to affirm that *Polytrema* contains no pillars that resemble, *so far as they extend*, those of his *Conulites* (= *Patellina*) or of *Orbitoides*, but merely meant that the solid pillars of *Polytrema*, being confined (where they exist) to the superficial layers, do not correspond with those of *Conulites* and *Orbitoides*, which range through their entire substance. Now I had never "imagined," much less affirmed, that the solid pillars of *Polytrema* extend through the fabric; on the contrary, I spoke of their presence as "occasional;" and it was in regard to their *texture* alone that I intended to liken them to those of the other types referred to—a likeness which Mr. Carter fully admits. I am happy to find, therefore, that our supposed difference on this point is only "imaginary."

2. On the subject of *Parkeria*, which is incidentally alluded to by Mr. Carter, it may be well for me to state that my description of it* is mainly founded on the *entirely uninfiltreated* specimen, preserving most unmistakably its original arenaceous structure, which was kindly placed in my hands by Prof. Morris, and that the accuracy of this description has been entirely confirmed by the examination of the gigantic

* 'Philosophical Transactions,' 1869.

arenaceous recent *Lituola* which my deep-sea explorations have supplied,—the sand-grains of *Parkeria*, however, chiefly consisting of phosphate and carbonate of lime, whilst those of *Lituola* are of quartz cemented with phosphate of iron. I must own myself unable to understand Mr. Carter's hypothesis of a "reticulated fibre converted by fossilization into calc-spar, and coated with a granular crystallization of yellowish calcareous material," and submit that no inferences from the appearances presented by a wholly or partially infiltrated specimen should be set against the facts readily discernible in one which shows every indication of having remained, save as regards the disappearance of the animal, exactly as it was when first formed.

XLI.—*Description of a new Frog from North-eastern Asia.*

By Dr. ALBERT GÜNTHER, F.R.S.

Rana Dybowskii.

Allied to *R. esculenta*. Snout depressed, rather pointed, of moderate length, with the caudus rostralis very obtuse. *Tympanum indistinct*, much smaller than the eye. The vomerine teeth form two short, *distinctly convergent* rows between the inner nostrils. A very faint glandular fold on each side of the back; otherwise the skin is smooth. Hind limbs of moderate length, the distance between vent and knee being half the length of the body. Tips of the fingers and toes not swollen; the latter broadly webbed, the web extending nearly to the tips of the fifth and third toes. No cutaneous fringe along the outer margin of the fifth toe. Metatarsus without lateral fold, but with two tubercles, the inner of which is oblong, the outer very small and scarcely distinct. The fifth toe is a little longer than the third, and the fourth much longer than either. Thumb of the male with two large swollen callosities. Vocal sacs small, internal, one below each angle of the mouth, with very small openings.

The specimen is nearly uniform olive-green above, with a few irregular black specks in the middle of the back. Lower parts white; throat and abdomen finely mottled with olive-green.

Length of the body 63 millims., of the hind limb 110, of the fourth toe 37.

We have received one adult male from the Warsaw Museum, which obtained it with other objects collected by Dybowski in Abrek Bay, near Wladiwostok, in lat. 43° N.